

Response Under 37 C.F.R. §1.116

Expedited Procedure

Examining Group 1792

Application No. 10/564,015

Paper Dated: February 10, 2009

In Reply to USPTO Correspondence of December 10, 2008

Attorney Docket No. 0149-053929

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

Claim 1 (Currently Amended): A process for forming a metal oxide film comprising a vapor deposition step in which a vapor of a hydrolysable metal compound and water vapor are brought into contact with a substrate to form a film of a metal oxide precursor on the surface of the substrate and a calcinations step in which the substrate is then heated in an oxidizing atmosphere to convert the precursor into a metal oxide, wherein in the vapor deposition step, the hydrolysable metal compound vapor and the water vapor which are reactant with one another, are previously mixed and the mixed vapors are brought into contact with the substrate within 3 seconds after mixing and wherein the vapor deposition step is carried out by injection of jetted streams of the hydrolysable metal compound vapor and water vapor toward the substrate which is continuously moving, and the mixing is performed by injecting the hydrolysable metal compound vapor and the water vapor in such a manner that the resulting two jetted vapor streams meet each other before they reach the substrate.

Claim 2 (Cancelled).

Claim 3 (Currently Amended): The process according to claim 2 claim 1 wherein the hydrolysable metal compound vapor is injected in a reverse direction with respect to the direction of movement of the substrate through a multi-orifice nozzle, and the water vapor is injected through a slit nozzle.

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Claim 4 (Currently Amended): The process according to ~~claim 2~~ claim 1 wherein the angles of the center lines of the streams of the hydrolysable metal compound vapor and water vapor (θM and θH_2O , respectively) satisfy the following relationship:

$$30^\circ \leq \theta M \leq 80^\circ \text{ and } \theta M \geq \theta H_2O,$$

and the flow rate of the stream of the hydrolysable metal compound vapor is greater than that of the water vapor.

Claim 5 (Previously Presented): The process according to claim 1 wherein the hydrolysable metal compound is a metal chloride.

Claim 6 (Original): The process according to claim 5 wherein the metal chloride at least predominantly comprises $TiCl_4$, the temperature of the substrate in the vapor deposition step is in the range of 150 – 250 °C, and the heating temperature in the calcination step is in the range of 300 – 600 °C.

Claim 7 (Previously Presented): The process according to claim 6 wherein the proportions of the $TiCl_4$ vapor and the water vapor fed to the vapor deposition step are such that they give a $TiCl_4/H_2O$ molar ratio in the range of 0.05 – 4.

Claim 8 (Original): The process according to claim 1 wherein the metal oxide film functions as a photocatalyst.

Claim 9 (Withdrawn): A vapor deposition apparatus for forming a film on the surface of a continuously moving substrate by a reaction between two vapors, wherein the apparatus comprises a multi-orifice nozzle and a slit nozzle disposed in such directions that the vapor streams injected through the respective nozzles meet each other.

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Claim 10 (Withdrawn): The vapor deposition apparatus according to claim 9 wherein the multi-orifice nozzle is disposed such that a vapor is injected therethrough in a reverse direction with respect to the direction of movement of the substrate.

Claim 11 (Withdrawn): The vapor deposition apparatus according to claim 9 wherein the pitch between adjacent orifices of the multi-orifice nozzle is in the range of from 3 mm to 10 mm.

Claim 12 (Withdrawn): The vapor deposition apparatus according to claim 9 wherein the two vapors are a vapor of a hydrolysable metal compound and water vapor, and the hydrolysable metal compound vapor is injected through the multi-orifice nozzle and the water vapor is injected through the slit nozzle.

Claim 13 (Withdrawn): The vapor deposition apparatus according to claim 12 wherein the angle θ_1 between the center axis of the multi-orifice nozzle and the surface of the substrate is in the range of from 30° to 80° , and the angle θ_2 between the center axis of the slit nozzle and the surface of the substrate is smaller than θ_1 .

Claim 14 (Withdrawn): The vapor deposition apparatus according to claim 13 wherein angle θ_1 is in the range of from 45° to 75° , and angle θ_2 is in the range of from 10° to 40° .

Claim 15 (Withdrawn): The vapor deposition apparatus according to claim 12 wherein the hydrolysable metal compound is a metal chloride.

Claim 16 (Withdrawn): The vapor deposition apparatus according to claim 15 wherein the metal chloride at least predominantly comprises $TiCl_4$.

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Claim 17 (Withdrawn): The vapor deposition apparatus according to claim 10 wherein the pitch between adjacent orifices of the multi-orifice nozzle is in the range of from 3 mm to 10 mm.

Claim 18 (Withdrawn): The vapor deposition apparatus according to claim 10 wherein the two vapors are a vapor of a hydrolysable metal compound and water vapor, and the hydrolysable metal compound vapor is injected through the multi-orifice nozzle and the water vapor is injected through the slit nozzle.